REMARKS/ARGUMENTS

Claims 18-25 are pending and remain as presented in the Amendment filed on December 29, 2009. Claims 18-25 are rejected as follows: (a) claims 18, 19 and 21-25 are rejected as obvious in view of the combination of Kuroda and Bae, (b) claims 18, 19 and 21-25 are also rejected as obvious in view of the combination of Minami and Bae, (c) claim 20 is rejected as obvious in view of the combination of Kuroda, Bae and Tsukamoto, and (d) claim 20 is also rejected as obvious in view of the combination of Minami, Bae and Tsukamoto. Applicants respectfully traverse these rejections.

The claimed invention relates to a hot-rolled wire rod obtained by (i) hot rolling a steel composition comprising C, Si, Mn, Cr, P and S in certain amounts (e.g., Cr in an amount of 0.3% or less, excluding zero%), (ii) performing a first cooling of the wire rod at an average cooling rate of 8-20°C/sec in a temperature range of from 900-670°C, and (iii) performing a second cooling of the wire rod at an average cooling rate of 1-5°C/sec in a temperature range of from 670-500°C, wherein ... a loading density (d/L) of the wire rod is controlled to be 0.20 or less when the wire rod is loaded on a loop conveyor during the first and second cooling, wherein d is the diameter of the wire rod and L is the ring pitch ... (see claim 18).

In the Amendment filed on December 29, 2009, Applicants argued that neither Kuroda nor Minami disclose or suggest the claimed d/L limitation. In response to these arguments, the Office currently asserts that the d/L limitation, as recited in independent claim 18, is a process limitation in a product-by-process claim. As such, the Office concludes that this limitation is given no patentable weight without an explanation of a correlation between the processing-based d/L limitation and one or more structural features of the resulting wire rod. In light of such remarks by the Office, Applicants provide the following comments with respect to the correlation between the claimed (processing-based) d/L limitation and the claimed (structural) features of the resulting wire rod.

The specification of the present invention explains how the four mechanical (structural) properties of the wire rod as recited in claim 18 are able to be obtained not only by the claimed two-step cooling, but also by controlling the loading density (d/L) of the wire rod:

> "In order to obtain prescribed mechanical properties intended in the present invention, it is necessary to: heat a casting satisfying the aforementioned component regulations; hot-roll the casting to a wire rod of a prescribed diameter (5.5 or 5.0 mm); and thereafter subject the wire rod transferred onto a conveyer to controlled-cooling and control the loading density (d/L, d means the diameter of a wire rod and L a ring pitch (distance between adjacent two loops of a wire rod)) of the wire rod to 0.20 or less. The present invention is characterized particularly by regulating, while controlling, a rolling speed and a conveyer transfer speed so that a wire rod loaded on a conveyer after rolling may satisfy the expression $d/L \leq 0.20$. In the case of a conventional wire rod, TS_{AV} is controlled within a prescribed range by regulating the blast amount to a wire rod transferred onto a conveyer after hot-rolling or by taking a similar means. However, merely by that sort of means, $TS\sigma$ cannot be controlled and moreover desired values of RA_{AV} and $RA\sigma$ are hardly secured." (emphasis added) (paragraph bridging pages 16-17)

> "Next, the loading density (d/L), which is one of the features of the present invention, of a wire rod is explained. As explained earlier, in order to obtain a wire rod having desired mechanical properties (particularly, a wire rod having mechanical properties-of small variation), it is necessary to control d/L to 0.20 or less, and thereby an as-hot-rolled wire rod capable of conspicuously reducing the frequency of wire breakage in comparison with a conventional wire rod can be obtained. ... In this light, not only a cooling rate but also a loading density is also controlled in the present invention and thereby it becomes possible to keep a cooling rate constant at any portion of a wire rod (more precisely, the variation of the cooling rates at thick and thin portions is within 5°C/sec), obtain a wire rod having mechanical properties of low variation, and resultantly improve wire drawability considerably. ..." (emphasis added) (paragraph bridging pages 18-20)

Accordingly and in light of the foregoing excerpts from the specification, Applicants submit that there is a definite correlation between the processing-based d/L limitation and one or more structural features of the resulting wire rod. As such, the Office's dismissal of the claimed d/L limitation as having "no patentable weight" is **erroneous** as the Office's dismissal is based on the faulty assumption that the claimed process limitation (i.e., d/L) does not impart structural characteristics to the claimed wire rod.

Furthermore, Applicants remind the Office that both Kuroda and Minami fail to disclose the claimed processing limitations (e.g., d/L and two-step cooling) which result in the four claimed mechanical properties as recited in independent claim 18 (i.e., TS_{AV}, $TS\sigma$, RA_{AV} and $RA\sigma$). Accordingly, the cited references, alone or in combination, do **not** disclose or suggest the claimed wire rod having the claimed four mechanical properties and being obtained by the claimed processing parameters (e.g., *d/L* and two-step cooling). The Office's conclusion to the contrary, based on the erroneous dismissal of the claimed processing limitations that impart structural characteristics to the resulting wire rod, is therefore baseless.

In addition to Applicants previously filed arguments relating to the claimed d/L limitation, Applicants argued in the Amendment filed on December 29, 2009, that neither Kuroda nor Minami disclose or suggest the claimed two-step cooling. Just as above with respect to the d/L limitation, the Office has responded to such arguments with the current assertion that the two-step cooling limitation (as recited in independent claim 18) is a process limitation in a product-by-process claim, and as such, said limitation is given no patentable weight without a correlation between the processing-based two-step cooling limitation and one or more structural features of the resulting wire rod.

In light of these remarks by the Office, Applicants bring to the Office's attention the following paragraphs of the specification:

> "The control of a cooling rate is necessary particularly for securing a prescribed TS_{AV} Value. To be more precise, it is recommended to adopt double-step cooling; to rapidly cool a wire rod at an average cooling rate of 8 to 20°C/sec. (preferably 10 to 15°C /sec.) in the temperature range from 900°C to 670°C, and then to slowly cool it at an average cooling rate of 1 to 5°C /sec. (preferably 1 to 3°C /sec.) in the temperature range from 670°C to 500°C. The reason is that, with single-step cooling, when it is attempted to lower strength, ductility also lowers in proportion and thus required wire drawability cannot be obtained. Concretely, controlled cooling may be applied as mentioned above by, for example, using a Stelmor cooling device and regulating a blast amount." (emphasis added) (page 18, lines 12-26)

> "... In the case of such an existing method as represented by the aforementioned Patent document 1 for example, it is estimated that, since the loading density of a wire rod transferred onto a conveyer is not so much taken into consideration and merely a cooling rate is regulated by means of the adjustment of a blast amount or the like, unevenness in the cooling rate appears in such a manner that the portions of large loading densities (namely, the portions where a wire rod accumulates thick) are cooled insufficiently and the portions of small loading densities (namely, the portions where a wire rod accumulates thin) are cooled rapidly and, in particular, the portions of slow cooling rates mainly cause TS and RA to vary. In this light, not only a cooling rate but also a loading density is also controlled in the present invention and thereby it becomes possible to keep a cooling rate constant at any portion of a wire rod (more precisely, the variation of the cooling rates at thick and thin portions is within 5°C /sec.), obtain a wire rod having mechanical properties of low variation, and resultantly improve wire drawability considerably. ..." (emphasis added) (paragraph bridging pages 18-20)

Accordingly and in light of the foregoing excerpts from the specification, Applicants submit that there is a definite correlation between the processing-based two-step cooling limitation and one or more structural features of the resulting wire rod.[1] As such, the Office's dismissal of the claimed two-step cooling limitation as having "no patentable weight" is **erroneous** as the Office's dismissal is based on the faulty assumption that the claimed process limitation (i.e., two-step cooling) does not impart structural characteristics to the claimed wire rod.

Furthermore, Applicants remind the Office that both Kuroda and Minami fail to disclose the claimed processing limitations (e.g., d/L and *two-step cooling*) which result in the four claimed mechanical properties as recited in independent claim 18 (i.e., TS_{AV}, $TS\sigma$, RA_{AV} and $RA\sigma$). Accordingly, the cited references, alone or in combination, do **not** disclose or suggest the claimed wire rod having the claimed four mechanical properties and being obtained by the claimed processing parameters (e.g., d/L and *two-step cooling*). The Office's

[1] Applicants wish to point out that Figure 1 of the present invention depicts results for wire rods wherein the cooling technique was *not* like that claimed (i.e., cooling "B" rather than cooling "A"), and Figure 5 depicts results for wire rods within the scope of the claimed invention, including the cooling conditions. However, it is to be noted that these Figures *only* show the relationship between parameters d/L and $RA\sigma$ and no other parameters. Therefore, it must also be noted that in Figure 1, even though $TS\sigma$ and $RA\sigma$ were controlled at lower levels by controlling d/L in the claimed range, the wire drawability deteriorated and thus the examples of Table 1 are *not* inventive examples.

conclusion to the contrary, based on the erroneous dismissal of the claimed processing limitations that impart structural characteristics to the resulting wire rod, is therefore baseless.

In light of the foregoing, Applicants submit that no combination of the cited references render obvious the claimed product-by-process (i.e., a hot-rolled wire rod obtained by a particular process and having a specific composition and certain mechanical properties). As such, Applicants (i) respectfully request withdrawal of the obviousness rejections of record, (ii) submit that all now-pending claims are in condition for allowance, and (iii) respectfully request passage of this case to issue.

Respectfully submitted,

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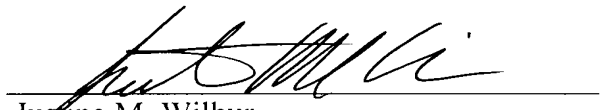

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